

## QUALITY OF TECHNICAL HIGHER EDUCATION FOR THE GLOBAL ECONOMY THROUGH CURRICULUM INNOVATION AND DEVELOPMENT

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### ABSTRACT

*The paper presents the experience of a Global Technology Management course implemented as a quality improvement innovative intervention at the Technical University "Gh. Asachi" of Iasi, Romania, the final year of the Business-Engineering Program. Aiming at improving quality of content and teaching methodology, the course focused on real, complex economic, political, technical and cultural problems affecting the decision making process in the area of global technologies through an active knowledge and experience exchange in an international environment built on Internet communication.*

### 1. INTRODUCTION: THE GLOBETECH PROJECT

The GlobeTech Project on Global Technology Management was initiated in 1995 at Albert Nerken School of Engineering, the Cooper Union New York, under the framework of the Gateway Engineering Education Coalition, a collaborative program supported by the Engineering Directorate of the National Science Foundation, USA.

Representing a diversity of institutional cultures, the Gateway Coalition aims at opening new "gateways" for learning by altering engineering education from a focus on course content to a focus on the development of human resources and the broader experience in which individual curriculum parts are connected and integrated.

The GlobeTech International Joint-Venture Simulation Project was designed and promoted by Prof. Roxanne Jacoby at Cooper Union [1] as an integrative, interdisciplinary international business simulation for undergraduate engineering students in the final year of study in order to develop Global Technology Management competencies for the global economy.

The yearly simulations aimed at familiarizing the participating students with the real and complex political, economic, social, and technical issues influencing global technology decisions today.

## **2. THE GLOBETECH-8 SIMULATION: THE ROMANIAN TEAM PERSPECTIVE**

### **2.1. Objectives**

The eight edition of the GlobeTech Project Simulation took place on the Internet October 2 - December 11, 2002 and dealt with issues regarding alternative energy sources, sustainable development, environmental developments, global competitiveness strategies, international negotiations, technology transfer and operations optimization.

The specific objectives of the simulation targeted:

- To offer the opportunity for students to explore, within a cross-disciplinary framework, global technology management, sustainable development, and alternative energy issues by working on concrete projects and to learn the specifics of international joint-venture project proposals, negotiations, contracts, etc
- To develop students' leadership, team work, verbal and written communication, cross-cultural awareness and international negotiation skills through the interactive simulation process
- To create the framework for both students and faculty to collaborate with other schools and broaden their domestic and international contacts and collaboration
- To increase students' familiarity with the use of the Internet for research and team communication and dissemination of new learning methods based on the use of modern information technology
- To increase foreign students' English proficiency

### **2.2. Simulation Description: The Romanian Team's Perspective**

The general themes of the eight edition of the GlobeTech Project Simulation were:

A) "NEW ENERGY SOURCE JOINT-VENTURE PROJECTS IN CHINA, ROMANIA, AND SINGAPORE":

- A 40 MW wind power farm joint-venture in China
- A hybrid power car manufacturing joint-venture in Romania
- A photovoltaic equipment manufacturing joint-venture in Singapore

B) "AN INTERACTIVE TV STATION IN FRANCE"

More than 70 students, in 12 teams, from 4 schools in 3 countries - France, Romania, and the U.S.A. - participated in the GlobeTech-8 simulation on A HYBRID POWER CAR MANUFACTURING JOINT-VENTURE IN ROMANIA: ESC-Toulouse, the Technical University "Gh. Asachi" of Iasi, NCA&T, and Cooper Union.

Following preparatory discussions via e-mail, a total of six teams participated in the hybrid car joint-venture project, on which the teams from Cooper Union and the Technical University "Gh. Asachi" of Iasi collaborated. The team from Cooper Union wrote the Request for Proposals (RFP), and five teams, two from ESC Toulouse, two teams from NCA&T, and one team from the Technical University "Gh. Asachi" of Iasi, wrote the responding proposals.

The development of the GlobeTech-8 simulation started with the preparation of the project infrastructure and Internet site (spring and summer of 2002). This development work took place at Cooper Union, the lead institution for this simulation since it has been firstly offered in 1995 [1].

The Globetech-8 Internet site was developed by the Cooper Union teams, under the lead of Prof. Roxanne Jacoby, as a MSN (Microsoft Network) private group free of charge from MSN [1]. This first time use of a private MSN group considered the following advantages:

- easy, password controlled, access for all registered group members from any computer
- included chat capability
- easy site creation, editing, use and control

The team of ten representing the Technical University "Gh. Asachi" of Iasi was recruited on a merit basis, including English proficiency, from the students in the final year of studies enrolled in the Business-Engineering Program, with their Major concentration in Mechanical, Electrical, Chemical and Textiles Engineering.

The recruitment focused on diversity in order to facilitate the interdisciplinary approach and teamwork required by the objectives and specific features of the simulation.

All the Romanian team's activities, from initial contacts and agreement with Cooper Union New York, to recruitment, to assessment and follow-up discussions and planning for the 2003-2004 simulation, were lead by the authors of this paper.

The Romanian team acted as a Romanian corporation which issued an international request for proposal for design, construction, and operation of a hybrid car (internal combustion / electric motor engine) manufacturing facility joint-venture in Caras-Severin area, negotiated by the team as the most appropriated (following a multi-criteria decision making process) to build the manufacturing facility.

The initial capacity of the plant was of 10,000 cars per year, with growth provisions to 40,000 in the 5 years following the plant reaching the 10,000 cars / year mark.

The request for proposal addressed the following issues:

- specific project objectives
- desired equipment technical characteristics
- personnel technical expertise required
- technical infrastructure requirements (such as desired location)
- type of joint venture sought:
  - % ownership
  - % equity and bonds
  - capital investment requirements, etc.
- financial information requirements:
  - project cost
  - profitability expectations
  - tax incentives if any, etc.
- managerial organization of the joint-venture
- other criteria such as:
  - technology transfer
  - local employee training
  - local / foreign equipment procurement
  - growth considerations, etc.
- desired marketing strategy
- export provisions

The project included one on-line computer international negotiation (on-line videoconference via the Internet) with the Cooper Union team that issued the Request for Proposals.

In order to prepare for the on-line negotiation, each student was responsible for a specific section of the project on which he / she wrote a final report presented to the instructor and team previously to the negotiation. All reports have been integrated in purpose to be used as key material in the negotiation process.

Considering the English proficiency criteria, the students designated their team leader for the project to negotiate on-line. All the other students have had the opportunity to communicate with the other teams by e-mail and Internet Chats.

During the on-line negotiation, the students made all decisions by themselves, instructors having only a facilitating and support role. This approach was deliberately intended to develop independence and critical thinking in students from a non-individualistic culture [2].

In respect with the Romanian team involved in the Simulation, the course program unfolded as following:

- October 02 - 23, 2002 - teams got acquainted and started Internet Chat discussions. The designated teams from the Cooper Union New York issued the Request for Proposals (RFP) on October 23, 2002
- October 24 - November 20, 2002 - the Romanian and other international manufacturing firms worked on and posted project proposals / bids on November 20, 2002. The main items covered in the proposals addressed:
  - The firm's qualifications for the project
  - The suggested project size and estimated cost, reasons for choosing a specific approach
  - The specific technical, environmental and managerial data:
    - technology approach
    - equipment to be used
    - manufacturing criteria
    - ISO-9000, ISO -14000
    - operations organization, etc.
  - The desired managerial and financial terms of the joint venture
- November 27, 2002 - the on-line videoconference between the Cooper Union team and the Romanian team
- November 28 - December 09, 2002 - discussions between the teams continued via e-mail in order to clarify, negotiate and improve the proposals.
- December 09, 2002 - the contract was awarded to one of the ESC-Toulouse teams, closely followed in the second place by the Romanian team
- Week of December 09, 2002 - the feedback process: students and faculty completed the post simulation questionnaires. The Romanian team underwent three debriefing and assessment meetings

Upon extended discussions during the three debriefing and assessment meetings with the students, there were stressed out the following conclusions:

- although all the students worked hard on the business plan, their behavior showed a natural rejection of planning as a reflection of short-term orientation of the Romanian culture mainly due to the planning hoaxes during the communism as well as the much ancient history that taught Romanians that “you can never know what will happen tomorrow...” so planning is useless [2]
- some of the topics were superficially approached; for instance, there were necessary repeated notifications from the instructors to the students to intensely examine the request for proposals. Many times there was an inclination to work on a certain topic without knowing very well what the request for proposals asked for; also the training issue, not considered as important by Romanian companies because "they already know ..." - high context communication - was poorly documented by the students [3]
- high power distance manifested by students not asking for timely support from the instructors; even though the instructors were accessible at all times and stressed out that

the experiment was based on a trial-and-error approach, the students didn't take enough advantage of their guidance and postponed to show their work unless upon request from fear to make mistakes

- the team work reflected well the native collectivist character of Romanian culture; periodically "free-riders" manifested and were accepted by the team members who assumed their work loads in exchange with other services not related to the simulation topics [3, 4]
- perpetual postponement of everything, last minute over-dimensioned effort and involvement in several tasks at the same time as an expression of a predominantly polychronic culture [3, 4] also characterized the students' behavior during the simulation

### **2.3. Main Outcomes of the GlobeTech-8 Simulation**

The main outcomes the GlobeTech-8 Simulation benefiting the Romanian team as well as all other participating teams enrolled in the project in respect to global practice and globalization were:

- Integration of subject matters previously studied with a teaching methodology based on IT in order to create an interdisciplinary learning environment
- Exposure to new technology virtual projects in various countries
- Promotion of collaboration, negotiations, and competition among various international teams
- Promotion of practical, stimulating, and interactive ways to learn global technology management issues in specific engineering fields
- Stimulation of creativity and innovation in both students and faculty to find the best technical, financial, and managerial solutions for each project
- Encouragement of international collaborative learning using the new long distance learning technologies for research and communication (e-mail, Internet Chat and teleconferences, etc.)
- Improvement of all students' verbal and written communication, team work and leadership skills, thus better preparing them for management roles in the global economy
- Improvement of English skills for students using English as a second language

### **3. CONCLUSIONS FOR THE ROMANIAN TEAM**

- Curriculum development for the final year of studies in the Business-Engineering Program at the Technical University "Gh. Asachi" of Iasi, based on the innovative approach of the Globetech-8 Project has an important contribution to quality improvement of technical higher education in the view of the requirements of the global economy
- Romanian students' behavior during the project showed their paramount interest to align the Romanian technical higher education to the international standards
- The novelty character of the activity as well as the team work environment created during the simulation, characterized by openness, freedom, equality, contribution, commitment and personal and team responsibility summed up as strong motivators for all participants in the project
- Other important factors enhancing team's performance were:
  - the international character of the competition and
  - the logistic support of the Cooper Union staff
- As limitations there has to be mentioned the following:

- the rigid structure of the Romanian technical higher education system
- too many class-hours leaving too little time to do research for the project
- high degree of uncertainty due to the experiential character of the project

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